REMARKS

In section 2 of the Office Action in the parent application, the Examiner rejected claims 45-51 under 35 U.S.C. §112, second paragraph, as being indefinite. The Examiner asserts that the coefficients a are defined in claim 45 as having a duration longer than the duration of a data block and that the coefficients of a filter are values that are not generally associated with temporal duration.

However, duration is an acceptable way of describing filter coefficients. The Examiner's attention is directed to two articles taken from the Internet which describe filters in terms of duration.

Accordingly, because duration is an acceptable way of describing a filter, claims 45-51 are definite under 35 U.S.C. §112, second paragraph.

In section 5 of the Office Action in the parent application, the Examiner rejected claims 1-5, 14-16, and 45 under 35 U.S.C. §103(a) as being unpatentable over Figure 2 of the present application in view of the McLane patent.

Independent claim 1 is directed to an equalizer having a finite filter and a post-processor. The finite filter has an output, and the finite filter is arranged

to substantially eliminate a ghost from a received signal in order to provide a substantially ghost free signal at the output. The post-processor applies a window function to the output of the finite filter, and the window function has a duration substantially equal to a duration of a block of data processed by finite filter.

As disclosed in the present application, Figure 2 shows the response h(t) of a FIR filter. This response is convolved with a received signal. The received signal contains the main signal and the ghost of the main signal. The FIR filter produces an output having a large peak representative of the main signal. Ghosts of the main signal have small components in the output of the FIR filter.

However, as shown in Figure 2, the values a^1, a^2, a^3, . . . of the taps of an FIR filter depend on the value of a and, in order to perfectly cancel a 100% ghost using an FIR filter, the value a of the FIR filter response must approach one. As the value a approaches one, the values of the taps of the FIR filter do not asymptotically decrease toward zero. Therefore, the FIR filter becomes infinitely long if a 100% ghost is to be eliminated, making the FIR filter impractical to eliminate a 100% ghost.

As recognized by the Examiner, there is no description in Figure 2 of a window function. Therefore, the Examiner relies on the McLane patent.

The McLane patent discloses two stations 21 and 25 that communicate with one another through a transmission line 23. The stations 21 and 25 are identical so only the station 25 is disclosed in detail. When data is transmitted by the station 25 over the transmission line 23, the transmission line 23 may produce an echo of the data back to the station 25 that will interfere with data transmitted by the station 21 to the station 25. Therefore, the apparatus of Figure 3 is provided to cancel the echo by coupling the data delivered to the transmission line 23 by the station 25 to the negative input of a summer 91 whose positive input is coupled to the transmission line 23. The summer 91 subtracts the data transmitted by the station 25 from the data received from the station 21 so as to cancel the echo.

Moreover, the stations 21 and 25 may operate at different clock rates. Therefore, the output of the summer 91 is processed by a windowed, all-pass interpolation filter 92, a sample rate conversion block 94, and an equalizer 95 which, together with a timing control 96 and a memory 93, adjusts the clock rate of the

data received from the station 21 to match the clock rate of the clock of the station 25. The interpolation filter 92 interpolates the output of the summer 91 to change the number of data sample rate of the output of the summer 91.

There is no disclosure in the McLane patent that the interpolation filter 92 employs a window function that has a duration substantially equal to a duration of a block of data processed by a finite filter. Indeed, the McLane patent does not disclose block processing at all.

The Examiner specifically cites column 7, lines 52-60 of the McLane patent. This portion of the McLane patent discloses that the impulse response of an interpolation filter 92 may be truncated to a low number of tap gains. This portion of the McLane patent goes on to disclose that, with the application of a window function, the filter 92 provides effective sample rate conversion, and that the filter 92 has an overall impulse response of $h(\varepsilon') = \sin c(n+\varepsilon')w(n+\varepsilon')$. In this equation, sinc(n) represents the filter and w(n) represents the window function.

As can be seen, there is no disclosure in column 7, lines 52-60 of the McLane patent that the interpolation filter 92 employs a window function that

has a duration substantially equal to a duration of a block of data processed by finite filter. Again, the McLane patent does not disclose block processing at all.

Therefore, even if Figure 2 of the present application and the McLane patent could be combined, the resulting combination would not meet the limitations of independent claim 1 because the McLane patent does not disclose a window function having a duration substantially equal to a duration of a block of data.

The Examiner asserts that the length of a data block may be arbitrary, i.e., the Examiner is making the duration of data fit the windowing function w(n). However, as disclosed in the present application, data is transmitted by transmitters in blocks. It is the duration of each of these data blocks, i.e., the data blocks defined by the transmitter, that determines the duration of the window function applied by the post-processor recited in independent claim 1. Therefore, a data block has a length or duration defined by the transmitter. The McLane patent does not disclose or suggest a window function having a duration that is substantially equal to the duration of a data block transmitted by the transmitter.

Accordingly, even if Figure 2 of the present application and the McLane patent could be combined, the

resulting combination would not meet the limitations of independent claim 1.

Moreover, as suggested above, the window function as disclosed in the McLane patent is provided so that, when the window function is combined with the impulse response of the filter, the sample rate of data is converted from a first sample rate to a second sample rate. Figure 2 of the present application relates to a filter that is intended to eliminate ghosts. The present application discloses or suggests no need for sample rate conversion in connection with Figure 2. Therefore, there is no suggestion in either the present application or in the McLane patent that the McLane patent and Figure 2 of the present application should be combined as suggested by the Examiner.

Furthermore, equation 5 of the McLane patent discloses that the interpolation filter 92 uses a sinc function to resample a signal during signal rate conversion. A sinc function is a sinx/x function that has a large lobe with tails at either end. The tails are truncated by the windowing function w(n). However, the interpolation filter 92 is still an interpolator. There is no suggestion that an interpolator or its windowing function w(n) can be used in combination with a ghost eliminating processor as required by independent claim 1.

Accordingly, there is no suggestion that the McLane patent and Figure 2 can be combined to meet the limitations of independent claim 1.

For all of the reasons given above, independent claim 1, and claims 2-5 and 14-16 dependent thereon, are not unpatentable over Figure 2 of the present application in view of the McLane patent.

In section 6 of the Office Action, the Examiner rejected claims 6 and 9 under 35 U.S.C. §103(a) as being unpatentable over the Ayanoglu patent in view of the McLane patent.

Dependent claim 6 is directed to an equalizer having (i) a finite filter that substantially eliminates a ghost from a received signal in order to provide a substantially ghost free signal at the output, (ii) a post-processor that applies a window function to the output of the finite filter such that the window function has a duration substantially equal to a duration of a block of data, and (iii) a pre-processor that applies coefficients b to the received signal.

In Figure 7, the Ayanoglu patent discloses a ghost canceller in which a received (ghosted) signal is pre-processed by a standard FIR or IIR equalizer 702 which eliminates ghosts with large delays. The resulting output signal then contains only distortion due to ghosts

with small delays. This output signal is then processed by an FIR or IIR equalizer 705 which eliminates ghosts with small delays.

The Ayanoglu patent does not disclose a post-processor that applies a window function to the output of the finite filter, where the window function has a duration substantially equal to a duration of a block of data. Therefore, the Examiner relies on the McLane patent.

However, as discussed above, the McLane patent does not disclose a window function having a duration substantially equal to a duration of a block of data, and does not suggest combining such a window function with a ghost eliminating filter. Accordingly, the combination of the Ayanoglu patent and the McLane patent does not meet the limitations of dependent claim 6.

Therefore, dependent claim 6 is patentable over the Ayanoglu patent in view of the McLane patent.

Dependent claim 9 is directed to an equalizer having (i) a finite filter that substantially eliminates a ghost from a received signal in order to provide a substantially ghost free signal at the output, (ii) a post-processor that applies a window function to the output of the finite filter such that the window function has a duration substantially equal to a duration of a

block of data, and (iii) a pre-processor that applies coefficients b to the received signal, where the coefficients b comprise steps of different magnitudes.

With regard to dependent claim 9, the Examiner asserts that the tap weights of a filter are generally of different magnitudes. While the tap weights of a filter are generally of different magnitude, the Examiner has not shown that such tap weights are stepped.

With regard to dependent claim 9, the Examiner further asserts that the coefficients of a window function are generally of different magnitudes. Again, the Examiner has not shown a stepped window function.

Furthermore, as discussed above, the Ayanoglu patent does not disclose a post-processor that applies a window function to the output of the finite filter, where the window function has a duration substantially equal to a duration of a block of data. Therefore, the Examiner relies on the McLane patent.

However, as discussed above, the McLane patent does not disclose a window function having a duration substantially equal to a duration of a block of data, and does not suggest combining such a window function with a ghost eliminating filter. Accordingly, the combination of the Ayanoglu patent and the McLane patent does not meet the limitations of dependent claim 9.

Therefore, dependent claim 9 is patentable over the Ayanoglu patent in view of the McLane patent.

INTRODUCTION

In view of the above, it is clear that the claims of the present application are definite and are patentable over the references applied by the Examiner. Accordingly, allowance of these claims and issuance of the above captioned patent application are respectfully requested.

Respectfully submitted,

SCHIFF, HARDIN, & WAITE
6600 Sears Tower
233 South Wacker Drive
Chicago, Illinois 60606-6402
(312) 258-5774

By: ______________________
Trevor B. Joike
Reg. No: 25,542

August 28, 2003